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Do more graphic and aversive cigarette health warning labels affect Brazilian smokers' likelihood of quitting?

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HIGHLIGHTS

- The stronger warnings appear to have done a better job of reminding smokers to quit.
- Stronger warnings were associated with greater defensive-avoidance of their contents.
- Aversive warnings may act synergistically with other interventions to help cessation.

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ABSTRACT

Between 2008 and 2013, Brazil experienced a large decline in smoking prevalence, with an innovative round of aversive pictorial health warnings implemented on cigarette packs and at points of sale in 2009. The objective of this study was to examine changes over time in the distribution of quitting attempts and self-reported thoughts about quitting due to health warnings among current smokers. We conducted a pre-post study to evaluate data from two nationally-representative surveys conducted in 2008 and 2013. Responses to questions on smokers' quitting attempts in the last year (yes vs. no) and whether health warnings led them to think about quitting in the last month (yes vs. no) were combined into four categories, for which the distribution of the Brazilian smoking population by year was estimated. A multinomial model was used to obtain proportions for each category, adjusted by socio-demographic variables and nicotine dependence. The proportion of smokers who reported making a quitting attempt in the last year and stated that health warnings led them think about quitting smoking statistically increased over time (from 30.0% to 33.1%; p-value = 0.010). The percentage of those who answered "no" to these two questions also increased over time (from 23.5% to 32.9%; p-value ≤ 0.001). These findings suggest that innovative warnings introduced in Brazil likely served as a "reminder" for continuing to think about cessation among those who attempted to quit in the last year. These warnings may have also triggered more avoidance of thinking about their contents than the previous warnings, which some studies have found to promote subsequent quitting activity.

1. Introduction

Between 2008 and 2013, Brazil made significant advances in reducing smoking at the population level, with those who continued to smoke seeming to make more quit attempts (Szklo, Souza, Szklo, et al., 2015). Over this five year period, three tobacco control policies were implemented: 100% smoke-free policy, substantial tax increases, and the launching of the third set of pictorial health warnings (INCA, 2008; Brazilian Ministry of Finance, 2011; ACT-BR, 2011; Brazilian Presidency

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of the Republic, 2014). The latter were explicitly designed to promote a strong reaction of avoidance against cigarettes through the inclusion of aversive images selected through applying the principles of experimental psychology and neuroscience (e.g., the use of more arousing pictures, where the presence of vivid tobacco physical harms are easy to understand, and exclusion of smoking cues, such as cigarettes, which stimulate smoking urges for smokers) (INCA, 2008; Volchan, David, Tavares, et al., 2013).

Previous studies have found that smokers' cognitive reactions to health warnings (e.g., thinking about health risks and/or about quitting because of them) predict interest in quitting and making quit attempts in the future (Hammond, Wakefield, Durkin, et al., 2013). Moreover, and counter intuitively, reported levels of avoiding warnings have been positively associated with subsequent quitting activity (Fathelrahman, Li, Borland, et al., 2013; Thrasher, Swayampakala, Borland, et al., 2015). Consistent with theories of attitude change (Witte & Allen, 2000; De Hoog, Stroebe, & de Wit, 2005), individuals who are beginning to feel the health effects of their behaviours, but who avoid the recommended protective action (i.e., "fear control"/"defensive avoidance"), may, nevertheless, be deeply processing risk messages (De Hoog et al., 2005).

Brazil's introduction of new, more aversive, warning images in 2009 makes it possible to examine changes over time in the distribution of quitting attempts and self-reported thoughts about quitting due to the health warnings among those who continue to smoke. This is the first nationwide evaluation of the innovative stronger health warnings introduced in Brazil.

1.1. Hypothesis

Consistent with the stage model of processing of fear-arousing communications (Witte & Allen, 2000; De Hoog et al., 2005), we hypothesized that more threatening health warnings would be associated with greater defensive avoidance of warning messages (stage 1) among smokers who have not yet followed the "recommended action" to avoid the smoking-related risks that warnings describe (i.e., they have not yet attempted to quit). On the other hand, among current smokers who have already engaged in the recommended action (i.e., have made a prior attempt to quit), the more threatening warnings should be more effective in encouraging cessation than less threatening messages (stage 2).

2. Methods

This is a pre-post study to evaluate data from the Global Adult Tobacco Survey (GATS-Brazil 2008 and GATS-Brazil 2013), which is part of the Global Tobacco Surveillance System established by the WHO to track the evolution of the tobacco epidemic (WHO, 2003).

GATS-Brazil cross-sectional surveys were nationally representative and conducted in 2008 and 2013. The surveys involved individual interviews on tobacco use perceptions, behaviours, and environment among adults 18 years and older. A complex probabilistic sample with four selection stages was chosen (municipalities, census tracts, households, and individuals aged 18 years and older). Only one individual per household (37,317 in 2008, and 60,237 in 2013) was randomly selected to answer questions about tobacco use. Detailed methods for both surveys have been published elsewhere (INCA, 2010; IBGE, 2014).

Quit attempt status was determined by answers to the question "During the past 12 months have you tried to stop smoking?". The assessment of the importance of health warnings to help cessation was based on the following question: "In the last 30 days, have the health images and warnings labels on cigarette packages led you to think about quitting smoking?". Smokers who reported in a separate question that they had not noticed health warnings in the previous 30 days were included in the group who gave no importance to health warnings to help cessation.

Information on cigarette smoking prevalence status was based on two questions: (1) "Currently, do you smoke?", categorized as 'daily', 'less than daily', or 'not at all'; and, if 'daily' or 'less than daily', (2) "On average, how many (manufactured OR hand-rolled OR Clove/Bali) cigarettes do you smoke (per day OR per week)?". Individuals who reported any consumption of these three types of cigarettes were considered current cigarette smokers.

For respondents who reported being daily smokers, answers related to time to first cigarette after waking and average daily consumption were combined to create the *Heaviness of Smoking Index* (*HSI*) (Heatherton, Kozlowski, Frecker, et al., 1989). As in a previous study (Chabrol, Niezborala, Chastan, et al., 2005), degree of nicotine dependence was stratified according to two categories: light ($HSI \leq 3$) and heavy ($4 \leq HSI \leq 6$). Occasional smokers were categorized as "light".

Data were also collected on socio-demographic characteristics, such as gender, age, educational level, and area of residence.

2.1. Data analysis

We combined the answers related to "quitting attempts status" and "the importance of the health warnings to lead smokers think about quitting" to estimate the distribution of the entire Brazilian smoking population by year of survey according to the four possible combinations of responses (yes/yes, yes/no, no/yes and no/no). By doing this, we are able to better understand the population impact of the introduction of stronger health warnings, while also taking into consideration the fact that current smokers seem to be making more quitting attempts (Szklo, Souza, et al., 2015). A multinomial logistic regression model was used to obtain the proportions adjusted by gender, age, educational level and degree of nicotine dependence. For all analyses, p-value ≤ 0.01 was used to define statistical significance.

STATA 12.0 statistical application was used, taking also into account the complex study design and sample weights (STATA, 2011).

3. Results

Overall, quitting attempts increased between 2008 and 2013 (from 41.3% to 47.2%; p-value ≤ 0.001; see Table 1). Marked absolute decreases in cigarette smoking prevalence rates were observed in Brazil between 2008 and 2013 and males with low educational level showed even a greater decline in smoking prevalence than male smokers with high educational level (Szklo, Souza, et al., 2015). Thus, the estimate of 24.0 million cigarette smokers in Brazil in 2008 (quitting attempt status: yes, 9.9 million; no, 14.1 million) was reduced to 21.2 million cigarette smokers in 2013 (quitting attempt status: yes, 10.0 million; no, 11.2 million). In addition, the proportion of current smokers with less than secondary school decreased statistically significantly between 2008 and 2013, irrespective of quitting attempt status (Table 1). Males, individuals older than 24 years and those living in urban areas comprised the great majority of cigarette smokers in Brazil, irrespective of year of the survey and quitting attempt status. The percentage of males, heavy smokers and daily smokers were higher among current smokers who did not attempt to quit than among those who made a quit attempt in the last year, irrespective of the year of the survey (Table 1).

The proportion of smokers who reported making a quitting attempt in the last year and stated that health warnings led them to think about quitting smoking more recently increased over time (from 30.0% to 33.1%; p-value $= 0.010$) (Table 2). Although of lower magnitude, the proportion of smokers who attempted to quit smoking in the last year but gave no recent importance to health warnings for stimulating thoughts about cessation also increased between 2008 and 2013 (from 11.3% to 14.1%; p-value ≤ 0.001).The percentage of those who did not make a quit attempt in the last 12 months and reported no recent thoughts about quitting due to the health warnings strongly increased over time (from 23.5% to 32.9%; p-value ≤ 0.001). Conversely,